

**IN THE CLAIMS**

Please amend the claims as indicated:

- 1 1. (previously presented) An apparatus for use on a bottom hole assembly (BHA) for  
2 conveying in a borehole in an earth formation, the apparatus comprising:  
3 (a) an orientation sensor making measurements indicative of a toolface angle  
4 of said BHA during rotation of the BHA;  
5 (b) at least one directionally sensitive formation evaluation sensor for making  
6 measurements of a property of said earth formation during said continued  
7 rotation; and  
8 (c) a processor which estimates from said directionally sensitive  
9 measurements and said orientation sensor measurements a local spatial  
10 characteristic of said earth formation  
11 wherein said BHA has a non-uniform rate of rotation.  
12
- 1 2. (previously presented) The apparatus of claim 1 wherein said local spatial  
2 characteristic comprises a dip of a bed boundary.  
3
- 1 3. (previously presented) The apparatus of claim 1 wherein said local spatial  
2 characteristic comprises a dip of an oil-water contact.  
3
- 1 4. (previously presented) The apparatus of claim 1 wherein said at least one

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2 directionally sensitive formation evaluation sensor comprises two directionally  
3 sensitive formation evaluation sensors spaced apart along an axial direction of  
4 said BHA..

5

1 5. (previously presented) The apparatus of claim 1 wherein the at least one  
2 directionally sensitive formation evaluation sensor comprises a galvanic  
3 resistivity sensor.

4

1 6. (original) The apparatus of claim 5 wherein said galvanic sensor comprises a  
2 focused sensor.

3

1 7. (previously presented) The apparatus of claim 1 wherein said at least one  
2 directionally sensitive formation evaluation sensor comprises an induction sensor.

3

1 8. (original) The apparatus of claim 7 wherein said induction sensor comprises a  
2 sensor having a coil with an axis inclined to an axis of said BHA.

3

1 9. (previously presented) The apparatus of claim 1 wherein said at least one  
2 directionally sensitive formation evaluation sensor comprises a resistivity sensor  
3 having a plurality of transmitter-receiver spacings and further comprises circuitry  
4 for measuring at least one of (i) an amplitude difference, and, (ii) a phase

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5 difference of signals measured at said plurality of spacings.

6

1 10. (original) The apparatus of claim 1 wherein said orientation sensor is associated  
2 with a first processor and said at least one resistivity sensor is associated with a  
3 second processor, said first and second processors being on a common bus.

4

1 11. (previously presented) The apparatus of claim 1 wherein said orientation sensor  
2 comprises at least one of (i) a magnetometer, (ii) an accelerometer, and, (iii) a  
3 gyroscope.

4

1 12. canceled

2

1 13. (previously presented) The apparatus of claim 1 further comprising a sensor for  
2 providing a measurement indicative of an inclination and azimuth of said  
3 borehole.

4

1 14. (original) The apparatus of claim 1 wherein said processor further determines a  
2 bias in said orientation measurements.

3

1 15. (canceled)

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- 1 16. (previously presented) The apparatus of claim 1 wherein said at least one  
2 directionally sensitive formation evaluation comprises a resistivity sensor is  
3 mounted on one of (i) a pad, (ii) a rib, and, (iii) a stabilizer.  
4
- 1 17. (previously presented) The apparatus of claim 1 wherein said processor further  
2 constructs and corrects an image of said borehole.  
3
- 1 18. (currently amended) The apparatus of claim 1 wherein ~~a processor~~ said processor  
2 further controls a drilling direction of said borehole based on said local spatial  
3 characteristic of said earth formation.  
4
- 1 19. (currently amended) The apparatus of claim 1 wherein said processor determines  
2 said local spatial characteristic of said earth formation based on an apparent rate  
3 of penetration of the BHA.  
4
- 1 20. (currently amended) A method of estimating a local spatial characteristic of an  
2 earth formation, the method comprising:  
3 (a) conveying a bottom hole assembly (BHA) into a borehole in an earth  
4 formation;  
5 (b) using an orientation sensor on said BHA for making measurements  
6 indicative of a toolface angle of said BHA during continued rotation of the

7 BHA;  
8 (c) using a first directionally sensitive formation valuation sensor on said  
9 BHA for making measurements indicative of of said local spatial  
10 characteristic of said earth formation during said continued rotation; and  
11 (d) estimating the local spatial characteristic of the earth formation from using  
12 said measurements of said directionally sensitive formation evaluation  
13 sensor and said orientation sensor measurements ~~said local spatial~~  
14 ~~characteristic of said earth formation~~, said estimation correcting for a non-  
15 uniform rate of rotation of said BHA.

16

1 21. (previously presented) The method of claim 20 further comprising using said  
2 determined local spatial characteristic for controlling a drilling direction of  
3 said borehole.

4

1 22. (previously presented) The method of claim 20 wherein said local spatial  
2 characteristic comprises a apparent dip angle between an axis of said borehole and  
3 a bed boundary in said earth formation.

4

1 23. (currently amended) The method of claim 20 wherein determining said ~~dip~~  
2 local characteristic further comprises using measurements from a second  
3 directionally sensitive formation evaluation sensor spaced apart axially from said

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4 first directionally sensitive formation evaluation sensor.

5

1 24. (previously presented) The method of claim 20 wherein the first directionally  
2 sensitive formation evaluation sensor comprises a galvanic sensor.

3

1 25. (original) The method of claim 24 wherein said galvanic sensor comprises a  
2 focused sensor.

3

1 26. (previously presented) The method of claim 20 wherein said first directionally  
2 sensitive formation evaluation sensor comprises an induction sensor.

3

1 27. (previously presented) The method of claim 26 wherein said induction sensor  
2 comprises a sensor having a coil with an axis inclined to an axis of said BHA.

3

1 28. (currently amended) The method of claim 20 wherein said first directionally  
2 sensitive formation evaluation sensor comprises a resistivity sensor with a  
3 plurality of transmitter-receiver spacings, and using said resistivity sensor further  
4 comprises ~~a making~~ making measurements of at least one of (i) and amplitude  
5 difference, and, (ii) a phase difference of signals measured at said plurality of  
6 spacings.

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1 29. (previously presented) The method of claim 20 further comprising coupling a first  
2 processor associated with said orientation sensor and a second processor  
3 associated with the first directionally sensitive formation evaluation sensor to a  
4 common bus.

1 30. (previously presented) The method of claim 20 wherein said orientation sensor  
2 is selected from the group consisting of: (i) a magnetometer, (ii) an  
3 accelerometer, and, (iii) a gyroscope..

1 31. **canceled**

1 32. (previously presented) The method of claim 20 further comprising using an  
2 additional sensor for providing a measurement indicative of an inclination and  
3 azimuth of said borehole.

1 33. (original) The method of claim 20 further comprising determining a bias in said  
2 orientation measurements.

1 34. **canceled**

1 35. (previously presented) The method claim 20 wherein said first directionally

2 ~~\_\_\_\_\_~~  
3 sensitive formation evaluation sensor is mounted on one of (i) a pad, (ii) a rib,  
4 and, (iii) a stabilizer.

1 36. (original) The method of claim 20 further comprising obtaining an image of said  
2 borehole.

1 37. (original) The method of claim 36 further comprising correcting said image.

1 38. (original) The method of claim 36 further comprising identifying tool face angles  
2 associated with a sticking of the BHA.

1 39. (previously presented) The apparatus of claim 1 wherein said directionally  
2 sensitive formation evaluation sensor is selected from the group consisting of (i)  
3 a resistivity sensor, and, (ii) a nuclear sensor.

1 40. (previously presented) The apparatus of claim 1 wherein said local spatial  
2 characteristic of said earth formation is selected from the group consisting of (i)  
3 a dip of an interface in said earth formation, and, (ii) an image of a wall of said  
4 borehole.

1 41. (previously presented) The apparatus of claim 4 further comprising a processor

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2 for determining from measurements made by said two directionally sensitive  
3 formation evaluation sensors a rate of penetration of said BHA.

4

1 42. (previously presented) The apparatus of claim 13 wherein said sensor for  
2 providing a measurement indicative of an inclination and azimuth of said  
3 borehole comprises a gyroscope.

4

1 43. (previously presented) The method of claim 20 wherein said directionally  
2 sensitive formation evaluation sensor is selected from the group consisting of (i)  
3 a resistivity sensor, and, (ii) a nuclear sensor.

4

1 44. (previously presented) The apparatus of claim 20 wherein said local spatial  
2 characteristic of said earth formation is selected from the group consisting of (i) a  
3 dip of an interface in said earth formation, and, (ii) an image of a wall of said  
4 borehole.

5

1 45. canceled

2

46. (currently amended) The method of ~~claim~~ claim 20 further comprising altering a  
direction of drilling of said BHA based at least in part on said estimated local  
spatial characteristic of said earth formation.

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7 BHA;

8 (c) using a first directionally sensitive formation valuation sensor on said

9 BHA for making measurements indicative of of said local spatial

10 characteristic of said earth formation during said continued rotation; and

11 (d) estimating the local spatial characteristic of the earth formation from using

12 said measurements of said directionally sensitive formation evaluation

13 sensor and said orientation sensor measurements ~~said local spatial~~

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